AD_____

Award Number: DAMD17-01-1-0121

TITLE: Breast Cancer Research Undergraduate Summer Training Program

PRINCIPAL INVESTIGATOR: Thomas T. Andersen, Ph.D.

CONTRACTING ORGANIZATION: Albany Medical College
Albany, NY 12208

REPORT DATE: June 2005

TYPE OF REPORT: Annual Summary

PREPARED FOR: U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

DISTRIBUTION STATEMENT: Approved for Public Release;
Distribution Unlimited

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
01-06-2005	Annual Summary	14 May 2003 - 13 May 2005

4. TITLE AND SUBTITLE
Breast Cancer Research Undergraduate Summer Training Program

5a. CONTRACT NUMBER

5b. GRANT NUMBER
DAMD17-01-1-0121

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Thomas T. Andersen, Ph.D.

E-Mail: anderst@mail.amc.edu

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Albany Medical College
Albany, NY 12208

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for Public Release; Distribution Unlimited

13. SUPPLEMENTARY NOTES
Original contains color plates: All DTIC reproductions will be in black and white.

14. ABSTRACT
Abstract follows.

15. SUBJECT TERMS
Cancer prevention, cancer therapy, toxicity, cell survival, undergraduate training program breast cancer, protein kinase

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER *(include area code)*
U	U	U	UU	20	

ABSTRACT

It is important to recruit a cadre of talented investigators whose careers are dedicated to studies of prevention, treatment, and early detection of breast cancer. By investing in young people before they make career choices, and by providing them with first-hand experience in modern breast cancer research (BCR) laboratories, we are finding that several of these young people discover an interest in BCR and are going on to graduate school or medical school and are actively involved with BCR at the next stage of their career. The Summer Undergraduate Research Program at the Albany Medical College is designed to recruit highly talented undergraduates and expose them to career-defining opportunities. That talented students are being recruited is evident from the diversity of undergraduate schools (83 in number), the quality of the matriculants (average GPA 3.54), and the number of applications (131) received. Students spend 90% of their time in the laboratory of a funded investigator doing authentic, meaningful, mentored BCR. Students also participated in a variety of Enrichment Activities, all focused on breast cancer.

Table of Contents

Introduction

This is the Final Report for DAMD17-01-1-0121, a training award entitled "Breast Cancer Research Undergraduate Summer Training Program." The funding agency did not offer opportunities to compete for continuation of funding of this program, but with careful management of grant funds, and with supplementation from the College, we made arrangements to provide the Breast Cancer Research program for the summer of 2004 even though the program had been scheduled to run from 2001 to 2003. A full cohort of students was accepted and trained for this no-cost extension summer. This training grant is based at the Albany Medical College (AMC) in Albany, NY. The award provides support for 5 students per year; with College supplementation we supported 5 students in the summer of 2004. At the time of report writing, four years of training are complete. To comply with earlier requests for cumulative data, information is provided about all four cohorts that have been trained (and the report is a little longer than specified).

Body

Relevance: This 2004 Undergraduate Summer Training Program (USTP) was focused on breast cancer research (BCR) in all aspects. Research opportunities focused on breast cancer research were available in 14 laboratories, funded by at least 17 different grants among 14 principle investigators. A broad range of disciplines was available from which undergraduates selected research projects, spanning the areas of peptide chemistry, anti-oncotic pharmaceutical development, cell biology and cell signaling studies, breast cancer prevention trials, and translational and clinical investigations. Enrichment Activities all centered around breast cancer, including career planning discussions, research seminars, literature review training sessions, "Meet the Investigator" sessions, and even sessions for training in scientific ethics. Undergraduates were immersed in a summer of breast cancer study, and are well prepared to enter a career path that will lead to productive contributions to the efforts to eradicate breast cancer early in this century. Two students from the AMC Summer Research Programs have matriculated in the Graduate Studies Program at Albany Medical College, one of whom is involved actively in Breast Cancer Research. Overall, at least 17 of 23 program alumni(ae) who have graduated from college have gone (or are going) on to professional school. Of the 4 that are employed, at least 3 are actively doing Breast Cancer Research.

Overview: The USTP at AMC is designed as a 10-week program to provide opportunities for 5 undergraduates per summer. Talented students are being recruited: 131 applications from 83 different colleges, including applications from as far away as the U.S. Virgin Islands, were received, which provided a competitive applicant pool from which the top 5 candidates were selected. Students spent more than two months in a laboratory doing meaningful, authentic, innovative research on a project specially designed for them, and with the active mentoring of an investigator who was funded and who had sufficient time and inclination to serve as a mentor for an undergraduate student. Funded faculty members were screened by the Program Director for inclusion on the Participating Mentor list based on funding, BCR interests, ability and inclination to serve as a mentor, and past experiences with mentoring undergraduate students. Students spent more than 90% of their summer doing research in a laboratory, but also had Enrichment Activities including Safety Training, on-line biomedical information search and retrieval training, training in issues of Responsible Conduct of Research, interactive learning opportunities focusing on an Overview of BCR, seminars to broaden their knowledge of BCR, preparation of their own research presentations, and opportunities to explore BCR career options while at AMC. A writing component enhanced students' ability to read and write scientific literature. This opportunity is evaluated as among the best (non-laboratory) training activities provided. The program provided extensive tracking and evaluation of the Students, of the Faculty, and of the program as a whole so as to make adjustments when necessary.

Progress

Task 1 Recruitment
a. Select Participating Mentors
These tables show the students, but also the mentors and their funding. Footnotes in tables 2 and 3 identify students not supported by grant funds.

Table 1 – Mentors, Funding Status, and Student Projects 2004

2004 Student	Mentor	Mentor Funding	Student Project Title
David Chrostowski	Michelle Lennartz, PhD	5R01AI050821-03	"The use of GFP, YFP, and CFP-Conjugated Proteins to Elucidate Phagocytic Signaling Pathways in RAW 264.7 Macrophages"
Amy Houghton	James Bennett, PhD	5R01CA102540-02	"Resveratrol: A Beneficial Addition to the Chemotherapeutic Agent Adriamycin?"
Laura Kaiser	Edmund Gosselin, PhD	5P01AI056320-03	"Low Level Fc RIIB-B Cell Receptor Co-Ligation Establishes a State of Global B Cell Receptor Non-Responsiveness"
Alanna Ramprashad	Tara Lindsley, PhD	R01AA11416-02	"Ethanol Decreases cAMP Levels in Axonal Growth Cones *in vitro*"
James White	Mario Canki, PhD	5R01NS040666-05	"Transcriptional Activation of Integrated HIV-1 in Primary Human Astrocytes by 5-aza-2' Deoxycytidine and Trichostatin A"

To comply with the request for cumulative data, we also show the information for Year 3 (2003, Table 2) Year 2 (2002, Table 3) and Year 1 (2001, Table 4).

Table 2 – Mentors, Funding Status, and Student Projects 2003

2003 Student	Mentor	Mentor Funding	Student Project Title
William Dowdle	Michelle Lennartz, PhD	5R01AI050821-02	"The Search for PKC-E Binding Partners"
Justin Georgekutty +	Thomas Andersen, PhD	1R01CA102540-01 5R25GM062460-04 1R25GM069249-01	"Therapeutic Effects of a Peptide Derived from Alpha-Fetoprotein on Breast Cancer in a Rat Model"
James Lee	C. Michael DiPersio, PhD	5R01CA084238-05	"Use of RT-PCR and Western Blotting to Assess α3β1 Dependent Expression of VEGF and Cell Survival Proteins in Keratinocyte Cell Lines"
Nicole Lemanski	Thomas Andersen, PhD	1R01CA102540-01 5R25GM062460-04 1R25GM069249-01	"Alpha-Fetoprotein Derived Peptide is Non-Toxic in a Mouse Model"
Emily Luidens +	Faith Davis, MD		"Effects of T4 and Estrogen on Resveratrol-induced Apoptosis in Human Cancer Cell Lines"
Ahmed Mousa +	Paul Davis, MD		"Studies of Cancer Cells in Culture"
Emily Roberge	Mario Canki, PhD	5R01NS040666-04	"Inhibition of HIV-1 Replication in T cells by Extracts from Five Medicinal Plants"
Bharat Yarlagada	J. Andre Melendez, PhD	5K22CA095011-02	"Redox Regulation on MMP-1 Production"

+ Supported by AMC, not by grant funds.

Table 3 – Mentors, Funding Status, and Student Projects 2002

2002 Student	Mentor	Mentor Funding	Student Project Title
Kelly Fisher	Charles Lowry, PhD	NSF0114040	"Genetic Characterization of the Regulatory Domain of the Mox 4 Transcriptional Factor in *S. cerevisiae*"
Roland Jacques	Paul Higgins, PhD	2R01GM057242-05	"The Role of Ras in the Signal Transduction Pathway of PAI-1"
Leroy Joseph *	Thomas Andersen, PhD	5R25GM062460-03 DAMD17-01-1-0472	"Optimal Synthesis of Cyclic Peptides that Prevent the Growth of Human Breast Cancer"
Rebekah Klinger +	Thomas Friedrich, PhD	Albany Molecular Research	"Point Mutations in the Nuclear Localization Signal of SV-40 Large T Antigen"
Alicia Strazza	Lisa Petti, PhD	5R29CA73682-03	"Tyrosine to Phenylalanine Mutations at Autophosphorylation Sites Alter the Neu* Receptor's Ability to Transform Human Diploid Fibroblasts"
Gayani Tillekeratne	Paula McKeown-Longo, PhD	5R01CA058626-11 5R01CA069612-07	"Anti-Angiogenic Activity of the First Type III Repeat of Fibronectin"

* Minority Student
+ Supported by AMC, not by grant funds.

Table 4 - Mentors, Funding Status, and Student Projects 2001

2001 Student	Mentor	Mentor Funding	Student Project Title
Kerri Ann Fraterigo	James Bennett, PhD	1R21CA87434-01 Elsa U Pardee Fnd	"The Role of TGF-β in the Growth Regulatory Effects of AFP-derived Peptide"
Jason Laliberte	C. Michael DiPersio, PhD	R01CA84238	"Lack of Integrin α3β1 Correlates to Increased Activation of jun-NH_2-terminal Kinase in Keratinocytes"
Kate Pettrone	Lisa Petti, PhD	5R29CA73682-03	"Determination of Amino Acids in the Transmembrane Domain of the *neu* Receptor Required for its Activation Under Conditions of Overexpression"
Lisa Schoonmaker	J. Andre Melendez, PhD	5K01CA77068-03	"Superoxide Dismutase-Dependent Peroxynitrite Production"
Adam Stallmer	Thomas Andersen, PhD	ANDT01 - New York State DAMD17-01-1-0472	"Acylated Lysine Analogs of Anti-Breast Cancer Peptides Retain Chemoprophylactic Effect and Serve as Model Ligands for Affinity Chromatography"
Courtney St. Amour	Michael Fasullo, PhD	5R29CA70105-06	"Mitotic Recombination in Yeast Ku Mutants"

All mentors were assessed as contributing and helpful.

b. Develop recruitment materials c. and d.) Distribute materials to colleges
A recruitment poster and application materials were developed and mailed, and application forms were posted on the College web site. These materials were appended in the first year's report and so are not duplicated this year. Since we have such a large number of applications (see Table 5), we conclude that our recruitment is appropriate.

Task 2. Selection of Students

Recruitment efforts led to a large number of applicants of very high quality. Table 5 shows that the program was very selective and very attractive. All of our top applicants enrolled in the program in the fourth year.

Table 5 – Recruitment of Students

Year	Number of Applications	Number of Acceptances	Number Enrolling
2004	131	5 – Army, Breast Cancer 5 – NIH, Cross Training 5 – RPI Program	5 – ARMY, Breast Cancer 4 – NIH, Cross Training 5 – RPI Program
2003	104	8 – Army, Breast Cancer 6 – NIH, Cross Training 5 – RPI Program	8 – ARMY, Breast Cancer (3 students paid from AMC funds) 6 – NIH, Cross Training 5 – RPI Program
2002	81	6 – Army, Breast Cancer 5 - NIH, Cross Training	6 – Army, Breast Cancer (1 student paid from AMC funds) 5 - NIH, Cross Training
2001	90	6 – Army, Breast Cancer 5 – NIH, Cross Training 8 – Volunteers	6 – Army, Breast Cancer 5 – NIH, Cross Training 8 – Volunteers
2000	34	17	16 - All AMC Undergraduate Programs
1999	21	6	6
1998	18	5	5
1997	26	5	5
1996	24	6	5

*Cross Training refers to a similar program for other students at AMC.

Tables 6, 7, 8 and 9 are updates from Year 4 (2004), Year 3 (2003), Year 2 (2002) and Year 1 (2001) cohorts. The tables show information about the individual matriculants and what their current status is (further schooling, employment, etc).

Table 6 - Data for BCR Matriculated Students, Summer 2004 (Year 4)

Table 6 shows that the quality of the matriculants was very high.

2004 Student	Undergrad. College	Year Completed at time of Acceptance	Major	GPA at time of Acceptance	Current Status
David Chrostowski	SUNY Plattsburgh	Junior	Biology	3.91	Employed in Breast Cancer Research Laboratory
Amy Houghton	University of Notre Dame	Junior	PreMed	3.46	Applying to Medical School
Laura Kaiser	Syracuse University	Junior	Biochemistry	3.44	Employed
Alanna Ramprashad	SUNY Albany	Junior	Biochemistry	3.13	Applying Medical School
James White	SUNY Albany	Junior	Biochemistry	3.74	Graduate School Baylor Medical College

The average GPA of all matriculants was 3.54 (on a 4.0 scale) for this year.

Table 7 - Data for BCR Matriculated Students, Summer 2003 (Year 3)

2003 Student	Undergrad. College	Year Completed at time of Acceptance	Major	GPA at time of Acceptance	Current Status
William Dowdle	Rochester Institute of Technology	Junior	Biotechnology	4.0	Employed in Breast Cancer Research Laboratory
Justin Georgekutty+	Rensselaer Polytechnic Institute	Sophomore	Biology	3.95	Medical School Albany Medical College
James Lee	Michigan State University	Sophomore	Microbiology	3.78	Medical School
Nicole Lemanski	Hamilton College	Junior	Biology / Art History	3.55	Employed Albany Medical College. Applying for Medical School
Emily Luidens +	Hamilton College	Freshman	Biology	3.8	Starting Senior year at Hamilton
Ahmed Mousa +	Cornell University	Freshman	Biology	3.19	Starting Senior year at Cornell
Emily Roberge	SUNY Albany	Sophomore	Biochemistry	3.94	Graduate School Baylor Medical College
Bharat Yarlagada	Rensselaer Polytechnic Institute	Sophomore	Biology	3.77	Medical School Albany Medical College

+ Supported by AMC funds

Table 8 – Updated Status of 2002 Cohort (Year 2)

2002 Student	Undergraduate College	Year Completed at time of Acceptance	Major	GPA at time of Acceptance	Current Status
Kelly Fisher	College of Saint Rose	Sophomore	Biology/ Cytotechnology	3.60	Employed Cytotechnology
Roland Jacques	University of Rhode Island	Junior	Microbiology	3.49	Medical School
Leroy Joseph	Cheney University	Junior	Chemistry	3.97	Graduate School at Albany Medical College
Rebekah Klinger	Hartwick College	Junior	Biology	3.59	Graduate School at Colorado State
Alicia Strazza	College of Saint Rose	Junior	Biology	3.85	Graduate School at Tufts University
Gayani Tillekeratne	Massachusetts Institute of Technology	Junior	Biology	4.8 (on a 5.0 scale)	Medical School at Duke University

Table 9 – Updated Status of 2001 Cohort (Year 1)

2001 Student	Undergraduate College	Year Completed At time of Acceptance	Major	GPA at time of Acceptance	Current Status
Kerri Ann Fraterigo	Russell Sage College	Sophomore	Biology	3.98	Medical School
Jason Laliberte	University of Massachusetts at Amherst	Junior	Biology	3.27	Graduate School at UMASS
Kate Pettrone	Williams College	Sophomore	Biology	3.36	Employed Easton Associates, NYC
Lisa Schoonmaker	Siena College	Sophomore	Biology	3.34	Employed General Electric, Schenectady, NY
Adam Stallmer	Rensselaer Polytechnic Institute	Sophomore	Math/ Science	4.0	Medical School at Syracuse
Courtney St. Amour	Brandeis University	Sophomore	Biology	3.88	Graduate School at Cornell

Task 3. Orientation of Summer Undergraduates
All required training sessions were completed in the first week, and team-building aspects were emphasized. A voluntary mountain hike provided a challenge and an opportunity for students to get to know one another, which helped with interactions throughout the rest of the summer. Other sessions included Laboratory Safety Training, Radioactivity Safety Training, Care and Use of Animals, and Internet-Based Search-and-Retrieval Training. Evaluation tools indicated that all aspects were successful.

Task 4. Research Training
Students participated actively in research for 10 weeks, guided by their mentor, a well-funded BCR investigator. Each student presented the results of their work at the end of the summer in poster or oral format (titles of these presentation are listed in Table 1). Students met weekly with Investigators to learn more about career paths and discuss research relevant to breast cancer.

Table 10 – Meet the Investigator Series

Evaluations indicated that students appreciated learning about career choices of these investigators, and about their research.

Week #	Investigator
1	Dr. C. Michael DiPersio
2	Mr. Christopher Fasano – Graduate Student
3	Career Topics – Medical and Graduate
4	Dr. Peter Vincent
5	Mr. Christian Line – Medical Student
6	Dr. Tara Lindsley
7	Dr. J. Andre Melendez
8	Dr. James Drake

Table 11 – Responsible Conduct of Research

Students were trained in the Responsible Conduct of Research in accordance with NIH recommendations. Students perceived the sessions as beneficial.

Sessions #	Title of Session
1	Current topics in Scientific Integrity
2	Introduction to Ethical Thinking
3	Workshop on Case Analysis by Moral Reasoning
4	Analytical Skills Workshop
5-8	Student-Led Role Playing and Case Discussion

Overview of Breast Cancer
The Overview of Breast Cancer didactic series included lectures that provided background information on cancer, oncogenes, angiogenesis, and the causes and treatment of breast cancer. Dr. Fassil Mesfin presented a series of sessions encompassing various aspects of breast cancer. The intent of the didactic lectures was to provide students with knowledge to supplement their laboratory research and to engender within the students a passion to pursue breast cancer research as a career.

Students in the BCR program read the following book and participated in detailed discussion of the BCR implications of the book.

Dr. Folkman's War – Angiogenesis and the Struggle to Defeat Cancer
Author: Robert Cooke

Writing Component A writing component was adapted and incorporated into the Breast Cancer Research program for half of the summer of 2002, and for the whole summer of 2003 and 2004. In this component, students were asked to use their Search and Retrieval skills to identify and read a paper related to Breast Cancer Prevention, and write a 1 or 2 page summary of the work. Students used their literature search skills, read scientific papers, enhanced their writing skills by providing a description appropriate for the scientific disciplines, and became familiar with a broad range of BCR investigations. Students received individualized feedback promptly, and incorporated the suggestions for the next week's assignment. BCR students wrote weekly assignments and made rapid progress in reading and interpreting the scientific literature. The individualized nature of the feedback ensured that each student worked on their own areas of greatest need and this ensured rapid progress. This is, by far, the most successful of all the non-laboratory-based activities, and is of tremendous benefit in preparing students for graduate school.

Table 12 - Career Day

Students were offered an afternoon session in which career options were discussed. Routes to BCR through graduate school and through medical school were outlined. Student evaluations indicated that this was very well received. For 2004, this session occured earlier, in week 2, so that undergraduates could better distinguish between graduate students and medical students with whom they interacted in the labs during the summer.

Career Opportunities Day	Presenter
The Road to Graduate School	Dr. Thomas Andersen, Assistant Dean for Graduate Studies
The Paths after Graduate School	Dr. Concetta DiRusso, Research Professor of Biochemistry
The Road to Medical School	Dr. James Bennett, Assistant Dean for Medical School Admissions
Career Paths after Medical School	Dr. Gennany Bratslowsky, PGY1 Resident
Life as a Graduate Student	Mr. Christopher Fasano, Graduate Student

Students also met individually with the P.I. on several occasions throughout the summer, and career goals were discussed and optimized.

Presentation Preparation - A session was offered to assist students in preparing for the end-of summer presentations.
Dr. C. Michael DiPersio - Poster Format Presentation & Writing a Scientific Abstract

Students presented their work (see Table 1 – for titles) before the faculty and students of the College in a Research Day designed especially for the Undergraduate Summer Research Programs at AMC. Students chose to present their results in a poster or oral format. Many students have the opportunity to make presentations at their home campus and were encouraged to select the format that would best suit their needs in upcoming months. Students find this aspect of their training to be as enjoyable as it is challenging.

Evaluation of Program
Aspects of the program were evaluated with multiple, quick, interesting evaluation tools. The intent is to encourage students to respond the evaluation tools they will receive annually for the next decade. Responses to the assessments were made by improving the design of the program, from one year to the next, as well as promptly within a summer.

Key Research Accomplishments
- Recruited 5 funded investigators who served as BCR mentors
- Received 131 applications
- Recruited 5 highly qualified students
- Trained students in Research
- Enriched students with a variety of BCR activities
- At least 3 students are currently involved in BCR
- Recruited 2 alumni to this graduate school

Reportable Outcomes
Students coauthored 4 publications from the research supported by this training grant:

1) DeFreest LA, Mesfin FB, **Joseph L**, McLeod DJ, **Stallmer A**, Reddy S, Balulad S, Jacobson HI, Andersen TT, Bennett JA: "Synthetic Peptide Derived from Alpha-Fetoprotein Inhibits the Growth of Human Breast Cancer: Investigation of the Pharmacophore and Synthesis Optimization." J. Peptide Research, 63, 409-419, 2004.

2) Preissler MT, **Kaiser L**, Drake JR, Gosselin EJ: "Low-level Signaling Generated by FcgammaRIIB-B Cell Receptor co-ligation Establishes a State of Global B Cell Receptor Non-Responsiveness." Immunol Invest. 34(1):53-70, 2005.

3) D. Unni, **A. Ramprashad**, J. Gillis and T.A. Lindsley: "Ethanol Exposure Alters Axon Response to BDNF *in vitro* Alcohol." Clin. Exp. Res. 29:127A, 2005

4) Fasullo, M., **St. Amour, C.**, and Zeng, Li: "Enhanced Stimulation of Chromosomal Translocations and Sister Chromatid Exchanges by either HO-induced Double-Strand Breaks or Ionzing Radiation in *Saccharomyces cerevisiae* yku70 Mutants" Mutation Res., in press.

Abstract: see appendix
Breast Cancer Research Undergraduate Summer Training Program
Authors: Andersen, TT and Cornwell JJ
Meeting: Era of Hope 2005 BCRP Meeting
Philadelphia, PA June 2005

At the Era of Hope 2005 meeting, the following 3 posters had authors who were alumni(ae) of this training program:

1) E.E. Uzgiris, B. Grimmong, and **L. Schoonmaker**. "Linear Polymeric Contrast Agents for Distinguishing Metastatic from Non-Metastatic Tumors"

2) T.T. Andersen, J.A. Bennett, H.I. Jacobson, L. DeFreest, **L. Joseph**, **N. Lemanski**, S. Bacon, N. Gildener-Leapman, and **J. Georgekutty**. "A Safe and Effective Novel Drug for the Prevention and Treatment of Breast Cancer"

3) H.I. Jacobson, T.T. Andersen, J.A. Bennett, **N.A. Lemanski**. "Exploiting fro Breast Cancer Control a Proposed Unified Mechanism for Reduction of Human Breast Cancer Risk by the Hormones of Pregnancy"

Students won awards stemming from the research supported by this training grant:
Emily Roberge - Award: 2004 Glenn Bumpus Award for Excellence in Research, University at Albany
2004 Department of Biological Sciences Award for Excellence in Research

Justin Georgekutty - Award: 2004 Rensselaer's Undergraduate Research Forum – 2nd Place

Alana Ramprashad - Award: 2005 Glenn Bumpus Award for Excellence in Research, University at Albany

Conclusion

All short-term objectives were met; all long-term objectives are being met. The program was very successful.

BREAST CANCER RESEARCH UNDERGRADUATE SUMMER TRAINING PROGRAM

T.T. Andersen and J.M. Cornwell
Albany Medical College, Albany, NY 12208

In order to eradicate breast cancer, it will be necessary to recruit and train talented investigators whose careers are dedicated to studies of the prevention, treatment, and early detection of that disease. The vision of the Undergraduate Summer Training Program in Breast Cancer Research (BCR) at the Albany Medical College (AMC) is to recruit highly talented undergraduates to careers in BCR. The goals are to see significant numbers of students matriculate in graduate schools and medicals schools and, while in professional school, contribute their expertise to BCR. Long term, the goal is to have a very high percentage of program alumni(ae) find careers involving BCR.

The AMC program has been very successful. A large number of applicants (averaging 100 applicants for 5 positions each year) apply for the summer opportunity, and they come from a large number of undergraduate institutions (averaging 40 different undergraduate colleges each year) from all over the Nation. Matriculants have very good undergraduate academic and prior research credentials, such that each summer we admit more students than the BCRP grant can support (average 8 matriculants per summer, 5 supported by BCRP and 3 by AMC). Students spend 90% of their time in the laboratory doing meaningful, mentored BCR-related research and invest 10% of their time on enrichment activities centered on BCR and designed to prepare them for graduate school. A very high percentage (>12/15) of program alumni(ae) have gone on to professional school, and of those, at least 1/3 are involved with BCR. Two alumni(ae) have matriculated at AMC and are involved with BCR.

The significance of this effort can be appreciated by considering the highly leveraged nature of the funding program and the outcomes that obtain. By investing a very small amount of funds in these training programs, the Breast Cancer Research Program (BCRP) of the USAMRMC caused this and many other institutions to mount outstanding training/recruiting opportunities and to invest heavily in those opportunities. This institution (and others) contributed faculty time and effort, laboratory space and supplies, educational components and campus facilities (*e.g.*, libraries and computers) without compensation, amounting to a large cost-sharing component of the BCRP program. Outcomes are similarly impressive in that a significant number of students in the training program are going on to be involved actively in BCR, clearly demonstrating that the purpose of the program is being accomplished. These training programs are among the most successful components of the BCRP portfolio, and that they were not offered in subsequent years is a major loss to the mission of the program.

Original work supported by USAMRMC DAMD17-01-1-0121.

BREAST CANCER RESEARCH UNDERGRADUATE SUMMER TRAINING PROGRAM

T.T. Andersen and J.M. Cornwell, Albany Medical College, Albany, NY 12208

Abstract

In order to eradicate breast cancer, it will be necessary to recruit and train talented investigators whose careers are dedicated to studies of the prevention, treatment, and early detection of that disease. The vision of the Undergraduate Summer Training Program in Breast Cancer Research (BCR) at the Albany Medical College (AMC) is to recruit highly talented undergraduates to careers in BCR. The goals are to see significant numbers of students matriculate in graduate schools and medicals schools and, while in professional school, contribute their expertise to BCR. Long term, the goal is to have a very high percentage of program alumni(ae) find careers involving BCR.

The AMC program has been very successful. A large number of applicants (averaging 100 applicants for 5 positions each year) apply for the summer opportunity, and they come from a large number of undergraduate institutions (averaging 40 different undergraduate colleges each year) from all over the Nation. Matriculants have very good undergraduate academic and prior research credentials, such that each summer we admit more students than the BCRP grant can support (average 8 matriculants per summer, 5 supported by BCRP and 3 by AMC). Students spend 90% of their time in the laboratory doing meaningful, mentored BCR-related research and invest 10% of their time on enrichment activities centered on BCR and designed to prepare them for graduate school. A very high percentage (>12/15) of program alumni(ae) have gone on to professional school, and of those, at least 1/3 are involved with BCR. Two alumni(ae) have matriculated at AMC and are involved with BCR.

The significance of this effort can be appreciated by considering the highly leveraged nature of the funding program and the outcomes that obtain. By investing a very small amount of funds in these training programs, the Breast Cancer Research Program (BCRP) of the USAMRMC caused this and many other institutions to mount outstanding training/recruiting opportunities and to invest heavily in those opportunities. This institution (and others) contributed faculty time and effort, laboratory space and supplies, educational components and campus facilities (*e.g.*, libraries and computers) without compensation, amounting to a large cost-sharing component of the BCRP program. Outcomes are similarly impressive in that a significant number of students in the training program are going on to be involved actively in BCR, clearly demonstrating that the purpose of the program is being accomplished. These training programs are among the most successful components of the BCRP portfolio, and that they were not offered in subsequent years is a major loss to the mission of the program.

Quality of the Program

The data show three important outcomes of offering the Breast Cancer Research Program. First, there was a very large increase in applications as soon as we announced these externally funded opportunities for undergraduates to train in our laboratories. Second, both the selectivity and attractiveness of the program are extremely good. Third, these programs attract outstanding students from diverse orgins.

Recruiting of Students to Summer Programs

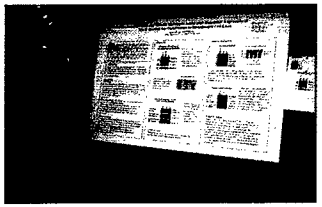
Year	Number of Applications	Number of Acceptances	Number Enrolling
2004	131	5 – Army, Breast Cancer 5 – NIH, Cross Training 5 - AMC Program	5 – Army, Breast Cancer 4 – NIH, Cross Training 5 - AMC Program
2003	104	8 – Army, Breast Cancer 6 – NIH, Cross Training 5 - AMC Program	8 – Army, Breast Cancer (3 students paid from AMC funds) 5 – NIH, Cross Training 5 - AMC Program
2002	81	6 – Army, Breast Cancer 5 – NIH, Cross Training	6 – Army, Breast Cancer (1 students paid from AMC funds) 5 – NIH, Cross Training
2001	90	6 – Army, Breast Cancer 5 – NIH, Cross Training 8 - Volunteers	6 – Army, Breast Cancer 5 – NIH, Cross Training 8 - AMC
2000	34	8	6 – All AMC Undergraduate Program
1999	21	6	6
1998	18	5	5
1997	26	5	5
1996	24	6	5

Year	Number of Applications	Number of Undergraduate Schools	GPA
2004	131	44	3.84
2003	104	39	3.81
2002	81	42	3.72
2001	90	40	3.83

Program Components

The "Bonding Trip" is a camaraderie-building event on the first weekend of the summer designed to facilitate interactions between students. With as many pure as possible, we take students up a challenging Adirondack mountain and talk about chemical bonding, energy barriers, and, at the top of the mountain, transition states.

Students spend 90% of their time in the laboratory doing meaningful, authentic, innovative research on a project specifically designed for them, with the active mentoring of a funded investigator who has sufficient time and inclination to mentor a student.

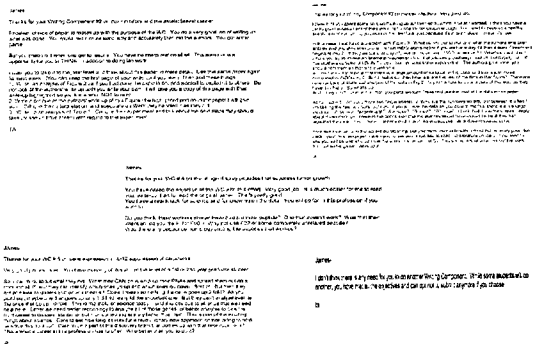


At the end of the summer, students present their research during Poster Day. Students enjoy talking about what they learned and how much they accomplished, and then take their poster with them when they return to their undergraduate campus. A training session guides them in the preparation of their posters, and an evaluation by faculty provides feedback on the poster and their presentation.

- Laboratory Research
- Writing Component
- Career Development
- Responsible Conduct of Research
- Meet the Investigators
- Overview of Breast Cancer
- Poster Day

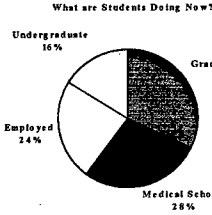
Writing Component

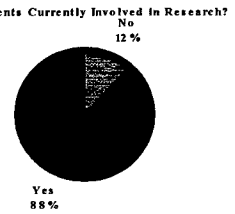
A special homework-style project is implemented in the first week and continues weekly until the end of the summer. Students are provided a copy of the Tuesday edition of the *New York Times* and asked to read one of the science articles. Next, students go to PubMed and identify an original scientific publication related to the newspaper story, retrieve the science publication, read it, and write a 1 or 2 page summary of the publication. Students get feedback each week, and make excellent progress on their literature searching skills, their writing ability, and on learning to read the scientific literature critically. Shown here is the weekly e-mail feedback to an individual student, showing the progress made over the course of the summer.

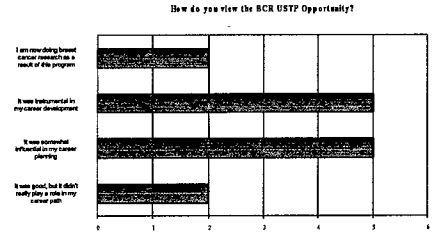


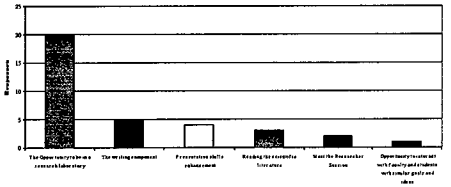
Outcomes

The USAMRMC invested $114,383 in this program, and supported *20* students in 4 years. The Albany Medical College participated heavily in cost-sharing, supporting *27* students and assuming all of the costs of advertising, teaching, library and faculty resources, camaraderie events and multiple others costs. Thus, the USAMRMC funding resulted in a highly leveraged program that trained *47* students.









Conclusions

- The USAMRMC invested a very small amount of money, resulting in extraordinarily successful, highly leveraged research training programs at this and other institutions.
- The BCR USTP at Albany Medical College attracted outstanding students and trained them in areas importantly related to Breast Cancer Research.
- A very high percentage of these students went on to graduate schools and medical schools after completing their undergraduate education.
- Many program alumni(ae) are involved in Breast Cancer Research while in professional school.
- A significant number of students are continuing their interest in BCR, clearly demonstrating that the purpose of the program is being accomplished.
- These training programs are among the most successful components of the BCRP portfolio, and that they were not offered in subsequent years is a major loss to the mission of the BCRP.

Support: DAMD 17-01-1-0121